WHAT IS CLAIMED IS:

1. An actuator for applying a force to an object, the actuator comprising: an inflatable bladder guided in expansion by a guide having asymmetrical expansion characteristics, the bladder having an inlet for inflating said bladder with fluid from a fluid source.

2. An actuator according to claim 1, wherein the guide constrains the bladder to expand preferentially in one direction upon inflation of the bladder.

3. An actuator according to claim 1 or 2 wherein the bladder is made from an elastomeric material.

4. An actuator according to claim 3 wherein the bladder and guide are integral with one another.

5. An actuator according to claim 4 wherein the bladder and guide comprise a tubular portion and the guide comprises reinforcing members extending circumferentially around the tubular portion.

6. An actuator according to claim 5 wherein the reinforcing members are affixed to a surface of the bladder.

7. An actuator according to claim 6 wherein the reinforcing members are embedded within material of the bladder.

8. An actuator according to any one of claims 1 to 3 wherein the bladder comprises an fluid-impermeable tubular portion extending through a tubular portion of the guide.

9. An actuator according to any one of claims 1 to 3 or 8 wherein the guide comprises a layer of material penetrated by apertures, the apertures arranged in an asymmetrical pattern so that the guide has a high-stretch direction and a low-stretch direction.

10. An actuator according to claim 9 wherein the apertures comprise slits.

11. An actuator according to claim 10 wherein the slits are oriented parallel to the low stretch direction.

12. An actuator according to claim 11 wherein the slits are oriented transversely to the high stretch direction.

13. An actuator according to any one of claims 10 to 12 wherein the slits are arranged in rows extending in the low-stretch direction.

14. An actuator according to claim 13 wherein the rows are staggered relative to one another so that the slits in each row are offset relative to the slits in an adjacent row.

15. An actuator according to any one of claims 9 to 14 wherein the guide comprises bands extending parallel to the low-stretch direction in which the material of the guide is substantially unbroken.

16. An actuator according to any one of claims 8 to 15 wherein the material of the bladder has a modulus of elasticity that is substantially direction independent.

17. An actuator according to any one of claims 9 to 15 wherein the guide comprises a material that is substantially inelastic in the low-stretch direction.

18. An actuator according to any one of claims 8 to 15 wherein the guide comprises an elastic material.

19. An actuator according to claim 9 wherein the guide has a modulus of elasticity in the low-stretch direction at least twice as great as a modulus of elasticity of the bladder.

20. An actuator according to any one of claims 1 to 3 or 8 wherein the guide comprises a layer of elastic material having a plurality of reinforcing members attached thereto, the reinforcing members extending in a low-stretch direction, the guide having a modulus of elasticity in the low-stretch direction substantially less than a modulus of elasticity in a high-stretch direction extending transversely to the reinforcing members.

21. An actuator according to claim 20 wherein the reinforcing members comprise elongated inelastic elements attached to the material of the guide.

22. An actuator according to claim 21 wherein the elongated inelastic elements are embedded within the material of the guide.

23. An actuator according to claim 20 wherein the reinforcing members comprise elongated thickened portions of the guide.

24. An actuator according to any of claims 1 to 3 or 8 wherein the guide comprises a woven cloth having asymmetrical stretch characteristics.

25. An actuator according to any one of claims 1 to 24 wherein the inflatable bladder comprises a plurality or tubular passages.

26. An actuator according to claim 25 wherein the tubular passages are arranged to extend generally parallel to one another.

27. An actuator according to claim 25 wherein each of the tubular passages extends from a first manifold common to the tubular passages.

28. An actuator according to claim 27 wherein each of the tubular passages extends between the first manifold and a second manifold common to the tubular passages.

29. An actuator according to any one of claims 25 to 28 wherein the tubular passages are closely spaced and, when inflated, provide a palisade-like array of parallel tubular passages.

30. An actuator according to claim 29 wherein, when the actuator is inflated, each of the tubular passages in the array is spaced apart from an adjoining tubular passage in the array by a distance of less than a width of the tubular passage.

31. An actuator according to any one of claims 25 to 30 wherein the tubular passages are each connected to an adjacent one of the tubular passages at at least one location along its length.

32. An actuator according to any one of claims 25 to 29 wherein the tubular passages are arranged in a planar structure.

33. An actuator according to claim 32 wherein the planar structure is penetrated by apertures, the apertures located between adjacent ones of the tubular passages.

34. An actuator according to any of claims 1 to 33 wherein the bladder comprises first and second sheets of elastic, fluid-impermeable material bonded to one another to define at least one fluid-carrying passage in fluid communication with the inlet.

35. An actuator according to claim 34 wherein the first and second sheets are joined to one another by internal seams which define islands are sealed from the fluid passages defined in the bladder.

36. An actuator according to claim 35 wherein the sheets are penetrated by apertures in the islands.

37. An actuator according to claim 38 wherein the guide extends through the apertures in the islands.

38. An actuator according to any one of claims 1 to 3 or 8 to 33 wherein the guide comprises first and second guide sheets joined together along seams and the bladder is located between the first and second guide sheets.

39. An actuator according to claim 38 wherein at least some of the seams are intermittent.

40. Apparatus for unloading a body part, the apparatus comprising first and second body-encircling members for attachment to a wearer's body on either side of the body part and at least one actuator according to any one of claims 1 through 39 connected between the first and second body-encircling members wherein the guide is oriented to control the expansion of the bladder to force the first and second body-encircling members apart upon inflation of the bladder.

41. Apparatus according to claim 40 wherein the first and second body-encircling members respectively extend through first and second sleeves and the first and second sleeves are respectively attached at first and second ends of the actuator.

42. Apparatus according to claim 40 or 41 wherein, for a given degree of inflation, the actuator applies a greater force between the first and second body-encircling members on one side of the first and second body-encircling members than on another side of the first and second body-encircling members.

43. Apparatus for unloading a body part, the apparatus comprising first and second belts for attachment to a wearer's body respectively about the wearer's hips and above the wearer's lumbar spine, an actuator according to any one of claims 25 to 33 or 35 to 37 connected between the first and second belts wherein the guide is oriented to control the expansion of the bladder to force the first and second belts apart upon inflation of the bladder and the actuator subtends an angle not exceeding 270 degrees measured relative to a central point ***P*** on the wearer's torso coronal midline .

44. Apparatus according to claim 43 wherein the first and second belts respectively extend through first and second sleeves and the first and second sleeves are respectively attached at first and second ends of the actuator.

45. Apparatus according to any one of claims 40 to 44 comprising a hand-operated pump connected to pump air into the inlet upon operation by a user.

46. A fluid-operable actuator comprising four sheets of material,

an innermost pair of the sheets being bonded together along one or more seams to form one or more fluid-tight bladders in fluid communication with a fluid source, and,

an outermost pair of the sheets having asymmetrical stretch properties and being bonded along one or more seams to constrain the fluid tight bladder to expand preferentially in one direction upon inflation.

47. An actuator according to claim 46 wherein the innermost pair of sheets are penetrated by at least one aperture and the outermost pair of the sheets are joined together at a seam in the aperture.

48. An actuator according to claim 46 wherein one or both of the outermost pair of the sheets are weakened in a pattern of asymmetry features.

49. An actuator according to any one of claims 46 to 48 wherein the bladder comprises a plurality of tubular passages.

50. An actuator according to claim 49 wherein a plurality of the tubular passages extend parallel to one another.

51. An actuator according to claim 49 or 50 wherein the tubular passages are closely spaced and provide a palisade-like arrangement of tubular passages when the actuator is inflated.

52. An actuator according to any one of claims 49 to 51 wherein each of the plurality of tubular passages are spaced apart from an adjacent one of the plurality of tubular passages by a distance of less than a width of the tubular passage.

53. An actuator according to any one of claims 49 to 52 wherein the bladder comprises first and second manifolds and the plurality of tubular passages each extend between the first and second manifolds.

54. An actuator according to one of claims 46 to 53 wherein the inner sheets are bonded together along at least one seam which is completely surrounded by the one or more fluid-tight bladders.

55. An actuator according to claim 46 wherein the at least one fluid-tight bladder comprises a series of parallel linear air pockets joined by an integral air manifold.

56. An apparatus for applying tension to a portion of the anatomy, the apparatus comprising first and second encircling members and one or more fluid extension actuators according to one of claims 46 to 55 coupled between the encircling members to apply a force separating the encircling members.

57. An apparatus according to claim 56 wherein a single actuator is disposed to extend around the back and sides of a wearer's torso such that forward edges of the actuator are at least even with of a coronal centerline of the wearer's torso.

58. An apparatus according to claim 57 wherein the actuator provides a substantially continuous palisade-like array of closely-spaced tubular passages extending from one forward edges of the actuator, around a wearer's back, to the other forward edge of the actuator.

59. An apparatus according to claim 57 or 58 wherein the actuator subtends an angle not exceeding 270 degrees measured from a centre point on the coronal centreline of the wearer's torso.

60. An apparatus according to any one of claims 56 to 59 wherein the encircling members are configured to be positioned respectively around the hips and the lower rib cage of the wearer.

61. An apparatus according to claim 60 where the encircling members comprise belts which are fastened with hook and loop closures.

62. An apparatus according to any one of claims 56 to 61 wherein the inner sheets are polyurethane sheets.

63. An apparatus according to claim 62 wherein the seams joining the inner sheets comprise RF welded seams.

64. An apparatus according to any one of claims 56 to 63 wherein the outer sheets comprise urethane sheets.

65. An apparatus according to any one of claims 56 to 64 wherein the outer sheets have a high stretch direction and a low stretch direction and a modulus of elasticity of the outer sheets in the low stretch direction is at least twice a modulus of elasticity of the inner sheets.

66. An apparatus according to claim 65 wherein the modulus of elasticity of the outer sheets in the high-stretch direction does not exceed the modulus of elasticity of the inner sheets.

67. An apparatus according to any one of claims 56 to 66 wherein the outer sheets comprise sheets of textile material having asymmetrical stretch properties.

68. An actuator or orthosis having any new and inventive feature, combination of features or subcombination of features disclosed herein.

69. A method for applying force to an object, the method comprising coupling one end of an actuator as described in any one of claims 1 to 37, 42 to 49 or 61 to the object, coupling another end of the actuator to another object, and inflating the actuator.

70. A method according to claim 69 wherein coupling one end of the actuator to the object comprises placing the one end of the actuator into a pocket connected to the object.